

**Latest bibliographic data on file with the International Bureau**

---

<b>Publication Number:</b>	WO/2004/041129	<b>International Application No.:</b>	PCT/IB2003/00487
<b>Publication Date:</b>	21.05.2004	<b>International Filing Date:</b>	31.10.2003

**Chapter 2 Demand Filed:** 08.04.2004

**Int. Class.<sup>7</sup>:** A61F 2/44

**Applicants:** **LDR MEDICAL** [FR/FR]; 4, Rue Marie Curie, F-10430 Rosieres-Pres-Troyes (FR) (*All Except US*).  
**BEAURIN, Jacques** [FR/FR]; Impasse du Milleraie, F-21910 Saulon La Chapelle (FR) (*US Only*).  
**FUENTES, Jean-Marc** [FR/FR]; Le Piquet, Alle des Msanges, F-34790 Grabels (FR) (*US Only*).  
**VITAL, Jean-Marc** [FR/FR]; Centre Hospitalier Pellegrin, Place Amlie Raba Lon, F-33076 Bordeaux Cedex (FR) (*US Only*).  
**DUFOUR, Thierry** [FR/FR]; 22, rue des Ormes, F-45160 Olivet (FR) (*US Only*).  
**HUPPERT, Jean** [FR/FR]; 16, alle Chataignire, F-42580 L'Etrat (FR) (*US Only*).

**Inventors:** **BEAURIN, Jacques** [FR/FR]; Impasse du Milleraie, F-21910 Saulon La Chapelle (FR).  
**FUENTES, Jean-Marc** [FR/FR]; Le Piquet, Alle des Msanges, F-34790 Grabels (FR).  
**VITAL, Jean-Marc** [FR/FR]; Centre Hospitalier Pellegrin, Place Amlie Raba Lon, F-33076 Bordeaux Cedex (FR).  
**DUFOUR, Thierry** [FR/FR]; 22, rue des Ormes, F-45160 Olivet (FR).  
**HUPPERT, Jean** [FR/FR]; 16, alle Chataignire, F-42580 L'Etrat (FR).

**Agent:** **DEBAY, Yves**; Cabinet Debay, 126, Elyse 2, F-78170 La Celle Saint Cloud (FR).

**Priority Data:** 0213833 05.11.2002 FR

**Title:** INTERVERTEBRAL DISK PROSTHESIS

**Abstract:** The present invention relates to an intervertebral disk prosthesis comprising at least three parts including a first plate, referred to as the upper plate (1), a second plate, referred to as the lower plate (2), and a core (3), the upper surface of the core (3) being in contact with at least part (10) of the lower surface of the upper plate (1) and the lower surface of the core (3) being in contact with at least part of the upper surface of the lower plate (2), and the lower plate (1) being movable at least with respect to the core (3), characterised in that there are cooperation means between the lower to plate (2) and the core (3), so as to limit or eliminate translation movements of the core (3) with respect to the lower plate (2) along an axis substantially parallel to the lower plate (2), and to limit or eliminate rotation movements

of the core (3) with respect to the lower plate (2), around an axis substantially perpendicular to the lower plate (2), the planes passing through the upper (1) is and lower (2) plates forming a substantially constant angle.

**Designated States:** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.  
African Regional Intellectual Property Org. (ARIPO) (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW)  
Eurasian Patent Organization (EAPO) (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM)  
European Patent Office (EPO) (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR)  
African Intellectual Property Organization (OAPI) (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Publication Language:** English (EN)

**Filing Language:** English (EN)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
21 May 2004 (21.05.2004)

PCT

(10) International Publication Number  
WO 2004/041129 A1

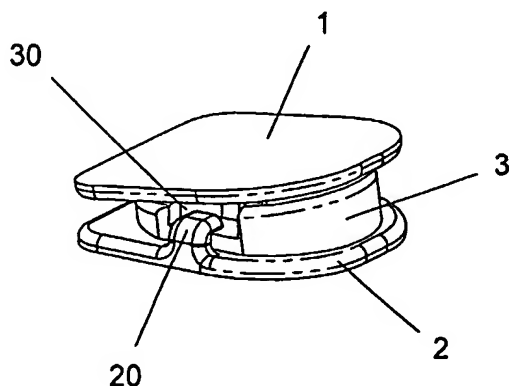
- (51) International Patent Classification<sup>7</sup>: A61F 2/44 F-45160 Olivet (FR). HUPPERT, Jean [FR/FR]; 16, allée Chataignière, F-42580 L'Etrat (FR).
- (21) International Application Number: PCT/TB2003/004872 (74) Agent: DEBAY, Yves; Cabinet Debay, 126, Elysée 2, F-78170 La Celle Saint Cloud (FR).
- (22) International Filing Date: 31 October 2003 (31.10.2003) (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 0213833 5 November 2002 (05.11.2002) FR (84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (*for all designated States except US*): LDR MEDICAL [FR/FR]; 4, Rue Marie Curie, F-10430 Rosières-Pres-Troyes (FR).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): BEAURIN, Jacques [FR/FR]; Impasse du Milleraie, F-21910 Saulon La Chapelle (FR). FUENTES, Jean-Marc [FR/FR]; Le Piquet, Allée des Mésanges, F-34790 Grabels (FR). VITAL, Jean-Marc [FR/FR]; Centre Hospitalier Pellegrin, Place Amélie Raba Léon, F-33076 Bordeaux Cedex (FR). DUFOUR, Thierry [FR/FR]; 22, rue des Ormes,

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: INTERVERTEBRAL DISK PROSTHESIS



(57) Abstract: The present invention relates to an intervertebral disk prosthesis comprising at least three parts including a first plate, referred to as the upper plate (1), a second plate, referred to as the lower plate (2), and a core (3), the upper surface of the core (3) being in contact with at least part (10) of the lower surface of the upper plate (1) and the lower surface of the core (3) being in contact with at least part of the upper surface of the lower plate (2), and the lower plate (1) being movable at least with respect to the core (3), characterised in that there are cooperation means between the lower plate (2) and the core (3), so as to limit or eliminate translation movements of the core (3) with respect to the lower plate (2) along an axis substantially parallel to the lower plate (2), and to limit or eliminate rotation movements of the core (3) with respect to the lower plate (2), around an axis substantially perpendicular to the lower plate (2), the planes passing

through the upper (1) and lower (2) plates forming a substantially constant angle.

## **INTERVERTEBRAL DISK PROSTHESIS**

The present invention relates to an intervertebral disk prosthesis, intended to substitute the fibrocartilaginous disks joining the vertebrae in the spinal column, particularly on the cervical spine.

Various types of prosthesis are known in the prior art. Some of these  
5 prostheses, either because they are made of compressible material or because they allow excessive movement of the different constituent parts of the prosthesis with respect to each other, may induce relatively easily the ejection of at least one part of the prosthesis outside the vertebrae, which is not desirable for the patient.

10 The purpose of the present invention is to remedy some drawbacks of the prior art by proposing a simple intervertebral disk prosthesis which makes it possible to limit the movements of the different constituent parts of the prosthesis with respect to each other.

This purpose is achieved by an intervertebral disk prosthesis  
15 comprising at least three parts including a first plate, referred to as the upper plate, a second plate, referred to as the lower plate, and a core, the upper surface of the core being in contact with at least part of the lower surface of the upper plate and the lower surface of the core being in contact with at least part of the upper surface of the lower plate, and the lower plate being  
20 movable at least with respect to the core, characterised in that there are cooperation means between the lower plate and the core, so as to limit or eliminate translation movements of the core with respect to the lower plate, along an axis substantially parallel to the lower plate, and to limit or eliminate rotation movements of the core with respect to the lower plate, around an  
25 axis substantially perpendicular to the lower plate, the planes passing through the upper and lower plates forming a substantially constant angle.

According to another feature, the lower plate comprises male means cooperating with female means of the core.

According to another feature, the lower plate comprises female means cooperating with male means of the core.

According to another feature, the angle is obtained in that the core forms an acute angle in the front-rear direction.

5        According to another feature, the same plates can be assembled with cores of different thicknesses.

According to another feature, the angle between the upper and lower plates is between 0° and 15°.

10       According to another feature the core is movable with respect to the upper and/or lower plates, which makes it possible to compensate for positioning defects of the three parts of the prosthesis with respect to each other.

According to another feature, at least part of the lower surface of the upper plate is concave and complementary to the upper surface of the core.

15       According to another feature, the dimensions of each male means are slightly less than those of each female means so as to enable a slight clearance between the core and the lower plate.

20       According to another feature, the dimensions of each male means are substantially the same as those of each female means so as to prevent any clearance between the core and the lower plate.

According to another feature, the male means of the lower plate are two pins curved towards the inside of the prosthesis and located opposite each other on two edges of the prosthesis, and in that the female means of the core are two recesses.

25       According to another feature, at least one of the pins is replaced by a lug equipped with a drilling whereon a tag is fixed using a dowel entering the drilling.

30       According to another feature, the male means of the lower plate are two dowel pins located in the vicinity of the centre of the lower plate, and in that the female means of the core are two wells.

According to another feature, the male means of the lower plate are two walls located opposite each other in the vicinity of two edges of the prosthesis, and in that the female means of the core are recesses.

According to another feature, the male means of the lower plate are a  
5 rib located at the centre of the prosthesis, and in that the female means of the core are a groove.

According to another feature, the core is made of polyethylene.

According to another feature, the lower plate comprises one or more openings in the vicinity of its front side, provided to receive prosthesis  
10 anchoring means in a vertebra.

According to another feature, the opening of the lower plate is rectangular, and in that the anchoring means consist of a body, forming an acute angle with the lower plate, and a head.

According to another feature, the openings of the lower plate are  
15 circular, and in that the anchoring means are nail-shaped.

According to another feature, the upper plate is convex on at least part of its upper surface to fit into the shape of the vertebrae.

Other features and advantages of the present invention will be seen more clearly upon reading the description below, with reference to the  
20 appended figures, wherein:

- figures 1a and 1b respectively represent a bottom view and a perspective bottom view of the upper plate according to one embodiment,

- figures 2a and 2b respectively represent a top view and a perspective top view of the lower plate according to one embodiment,

- 25 - figures 3a and 3b respectively represent a top view and a perspective top view of the core according to one embodiment,

- figures 4a and 4b respectively represent a perspective top view and a side view of the intervertebral disk prosthesis according to the embodiment of figures 1a, 1b, 2a, 2b, 3a and 3b,

- 30 - figures 5a and 5b respectively represent a side view and a sectional view along the plane D-D of figure 5a of the intervertebral disk prosthesis according to a second embodiment,

- figure 6a represents a side view of the intervertebral disk prosthesis according to a third embodiment,

5 - figures 6b and 6d represent a sectional view along the plane A-A of figure 6a, the core having, respectively, a slight clearance and no clearance with respect to the lower plate,

- figures 6c and 6e represent a sectional view along the plane B-B of figure 6b and 6d, respectively, of the intervertebral disk prosthesis,

- figures 7a and 8a respectively represent a top view and perspective bottom view of the lower plate according to two other embodiments,

10 - figures 7b and 8b respectively represent a perspective side view and a perspective top view of the lower plate of figures 7a and 8a, respectively, wherein prosthesis anchoring means are inserted according to two different embodiments,

15 - figure 9a represents a top view of the lower plate according to a fourth embodiment,

- figure 9b represents a sectional view of the lower plate along the plane plan C-C of figure 9a,

- figures 10a and 10b respectively represent a rear and side view of the upper plate according to another embodiment.

20 The intervertebral disk prosthesis according to the invention is constituted of an upper plate 1 which is articulated with respect to a lower plate 2 by means of a core 3, as can particularly be seen in figures 4a, 4b, 5a and 6a. One advantage of the prosthesis according to the invention is that it comprises simple parts which can be designed so that the prosthesis is fitted  
25 on the cervical spine.

The upper plate 1, particularly visible in figures 1a and 1b, is slightly concave on at least part 10 of its lower surface, so as to fit with the slightly convex upper surface of the core 3. The upper surface of the core 3 is complementary to the concave part 10 of the upper plate 1, enabling  
30 movement between the upper plate 1 and the core 3.

In an alternative embodiment, part of the upper surface of the upper plate 1 is convex, as shown in figures 10a and 10b, in order to fit better onto

the vertebra whereon the prosthesis is to be fitted, the bottom of the vertebrae being concave. In this case, the convex part of the upper plate 1 is located in the front part of the upper plate, as can particularly be seen in figure 10b.

5           The lower plate 2 is substantially plane. In effect, its lower surface does not need to be convex or concave since the top of the vertebrae is substantially flat. In the embodiment of figures 2a, 2b, 7a and 8a, the lower plate 2 comprises two pins 20 located opposite each other on two substantially parallel edges 21, 22 of the lower plate 2. Each pin 20 is curved  
10           towards the inside of the prosthesis and can thus enter recesses 30 located on the core 3. The core 3, particularly visible in figures 3a and 3b, comprises a substantially plane lower surface, provided to fit onto the lower plate 2. The core 3 is thin (for example 3 mm thick) for a cervical prosthesis or thicker (for example 15 mm) for a lumbar prosthesis.

15           In the embodiment of figures 3a, 3b, 4a and 4b, the dimensions of each recess 30 of the core 3 are slightly greater than those of each pin 20 of the lower plate 2 so as to limit the clearance of the core 3 with respect to the lower plate 2, both in translation along an axis substantially parallel with the lower plate 2, and in rotation around an axis substantially perpendicular to  
20           the lower plate 2. The movement between the upper plate 1 and the core 3, as well as the clearance of the core 3 with respect to the lower plate 2, thus enable the patient to move and, if required, compensate for prosthesis positioning defects. This clearance also offers the advantage of preventing premature wear due to the stress applied to the prosthesis.

25           In the embodiment of figures 5a and 5b, the dimensions of each recess 30 of the core 3 are substantially the same as those of each pin 20 of the lower plate 2, so as to prevent any clearance of the core 3 with respect to the lower plate 2, both in translation and rotation. In the latter case, the only movement of the prosthesis authorised is that of the upper plate 1 with  
30           respect to the core 3.

          In the embodiment in figures 9a and 9b, one of the pins 20 is replaced by a lug equipped with a drilling 200. A tag 23 fixes on the lug by means of a



dowel 24 entering the drilling 200. In an alternative embodiment, both pins are replaced by a lug whereon a tag 23 is fixed.

In the embodiment of figures 6a, 6b, 6c, 6d and 6e, the lower plate 2 does not comprise any pins 20 but two dowel pins 25 located in the vicinity of the centre of the lower plate 2. In this case, the core 3, by complementarity, does not comprise any recesses 30, but two wells 35 under its lower surface. The dimensions of the dowel pins 25 of the lower plate 2 and of the wells 35 of the core 3 are such that, in the alternative embodiment represented in figures 6b and 6c, a slight clearance in translation and rotation is permitted, and in the alternative embodiment represented in figures 6d and 6e, no clearance is permitted.

In another embodiment, not shown, the lower plate 2 comprises a rib on its upper surface and no pins 20 or dowel pins 25. The core 3, by complementarity, comprises a groove under its lower surface. The dimensions of the rib of the lower plate and the groove of the core are such that, in one alternative embodiment, a slight clearance in translation and rotation is permitted, and in another alternative embodiment, no clearance is permitted.

In another embodiment not shown, the lower plate 2 comprises, instead of the pins 20, two walls, arranged opposite each other, in the vicinity of two substantially parallel edges 21, 22 of the lower plate, but further in the prosthesis than the pins 20. The core 3 comprises complementary recesses with respect to the walls. The dimensions of each recess of the core in this embodiment are, either slightly greater, or substantially the same as those of each wall of the lower plate, so as to enable a slight clearance in translation and rotation or not.

In a further embodiment not shown, the female components are located on the lower plate and the male components on the core.

The intervertebral disk prosthesis according to the invention particularly makes it possible to correct lordosis defects and to add lordosis to the spine, for example the cervical spine. Therefore, the presence of an acute angle in the front-rear direction F, figure 4b, between the upper plate 1

and the lower plate 2 of the prosthesis is necessary. For example, this angle is between 0° and 15°. To adjust the angle required according to the patient, it is simply necessary to select a core 3 with a suitable angle between the mean plane representing its upper surface and the plane passing through its lower surface.

When the female components are located on the lower plates and the male components on the core, the lordotic core, in that it forms an acute angle in the front-rear direction, may then be integral with the plate by a projection entering a cavity or opening of the lower plate.

The inclination of the prostheses known in the prior art is obtained, either by the shape of the upper plate, when the core is flat, or by the position of the upper plate with respect to the core, when said core is convex. With respect to the first case of the prior art mentioned here, the machining of the prosthesis according to the present invention is more economical since the core is composed of a less expensive material (for example, polyethylene) than that composing the plates. With respect to the second case of the prior art mentioned here, the core of the present invention is not liable to be ejected outside the prosthesis since the angle between the plates is substantially constant when the prosthesis is in place.

If surgeons require a determined lordosis for one patient, they will select a core 3 allowing no clearance with respect to the lower plate 2. On the other hand, if they simply require the lordosis to remain within a range of values, they will select a core allowing a slight clearance in translation and rotation with respect to the lower plate 2.

The intervertebral disk prosthesis according to the invention may, in one alternative embodiment, represented in figures 7a, 7b, 8a and 8b, be anchored in the spinal column to prevent the prosthesis from migrating under the effect of the transversal resultant of the force exerted by the spinal column on the prosthesis in place, which increases with the lordosis. In this case, the lower plate 2 comprises one or more openings 28, 29 located in the vicinity of the rear side of the prosthesis, making it possible to receive anchoring means 4, 5.

In this way, in the case of figures 7a and 7b, the opening 28 of the lower plate 2 is rectangular and the anchoring means 4 is constituted of a body 40 and a head 41. The dimensions of the head 41 are slightly greater than those of the opening 28 of the lower plate 2, such that, once the  
5 anchoring means 4 are in place in a vertebra, the lower plate 2 is sandwiched between the head 41 of the anchoring means 4 and said vertebra. An angle, less than or equal to  $90^\circ$ , is comprised between the body 40 of the anchoring means 4 and the lower plate 2.

In the case of figures 8a and 8b, two circular openings 29 are  
10 comprised in the lower plate 2 and the anchoring means 5 are nail-shaped, with a head of greater dimensions than those of the openings 29 to make it possible to sandwich the lower plate 2 between the head of the anchoring means 5 and the vertebra whereon the prosthesis is anchored.

It should be clear to those skilled in art that the present invention  
15 enables embodiments in numerous other specific forms without deviating from the scope of the invention as claimed. Consequently, the present embodiments must be considered as illustrations, but may be modified in the field defined by the scope of the attached claims, and the invention must not be limited to the details given above.

### CLAIMS

1. Intervertebral disk prosthesis comprising at least three parts including a first plate, referred to as the upper plate (1), a second plate, referred to as the lower plate (2), and a core (3), the upper surface of the core (3) being in contact with at least part (10) of the lower surface of the upper plate (1) and the lower surface of the core (3) being in contact with at least part of the upper surface of the lower plate (2), and the upper plate (1) being movable at least with respect to the core (3), characterised in that there are cooperation means between the lower plate (2) and the core (3), so as to limit or eliminate translation movements of the core (3) with respect to the lower plate (2) along an axis substantially parallel to the lower plate (2), and to limit or eliminate rotation movements of the core (3) with respect to the lower plate (2), around an axis substantially perpendicular to the lower plate (2), the planes passing through the upper (1) and lower (2) plates forming a substantially constant angle.
2. Intervertebral disk prosthesis according to claim 1, characterised in that the lower plate (2) comprises male means cooperating with female means of the core (3).
3. Intervertebral disk prosthesis according to claim 1, characterised in that the lower plate (2) comprises female means cooperating with male means of the core (3).
4. Intervertebral disk prosthesis according to any one of claims 1 to 3, characterised in that the angle is obtained in that the core (3) forms an acute angle in the front-rear direction (F).
5. Intervertebral disk prosthesis according to claim 4, characterised in that the same plates (1, 2) can be assembled with cores (3) of different thicknesses.

6. Intervertebral disk prosthesis according to any one of claims 4 or 5, characterised in that the angle between the upper (1) and lower (2) plates is between 0° and 15°.

5 7. Intervertebral disk prosthesis according to any one of claims 1 to 6, characterised in that the core (3) is movable with respect to the upper (1) and/or lower (2) plates, which makes it possible to compensate for positioning defects of the three parts (1, 2, 3) of the prosthesis with respect to each other.

10 8. Intervertebral disk prosthesis according to any one of claims 1 to 7, characterised in that at least part (10) of the lower surface of the upper plate (1) is concave and complementary to the upper surface (31) of the core (3).

15 9. Intervertebral disk prosthesis according to any one of claims 1 to 8, characterised in that the dimensions of each male means are slightly less than those of each female means so as to enable a slight clearance between the core (3) and the lower plate (2).

20 10. Intervertebral disk prosthesis according to any one of claims 1 to 8, characterised in that the dimensions of each male means are substantially the same as those of each female means so as to prevent any clearance between the core (3) and the lower plate (2).

25 11. Intervertebral disk prosthesis according to any one of claims 2 and 4 to 10, characterised in that the male means of the lower plate (2) are two pins (20) curved towards the inside of the prosthesis and located opposite each other on two edges (21, 22) of the prosthesis, and in that the female means of the core (3) are two recesses (30).

12. Intervertebral disk prosthesis according to claim 11, characterised in that at least one of the pins (20) is replaced by a lug equipped with a drilling (200) whereon a tag (23) using a dowel (24) entering the drilling (200).

30 13. Intervertebral disk prosthesis according to any one of claims 2 and 4 to 10, characterised in that the male means of the lower plate (2) are two

dowel pins (25) located in the vicinity of the centre of the lower plate (2), and in that the female means of the core (3) are two wells (35).

14. Intervertebral disk prosthesis according to any one of claims 2 and 4 to 10, characterised in that the male means of the lower plate (2) are two  
5 walls located opposite each other in the vicinity of two edges (21, 22) of the prosthesis, and in that the female means of the core (3) are recesses.

15. Intervertebral disk prosthesis according to any one of claims 2 and 4 to 10, characterised in that the male means of the lower plate (2) are a rib located at the centre of the prosthesis, and in that the female means of the  
10 core (3) are a groove.

16. Intervertebral disk prosthesis according to any one of claims 1 to 15, characterised in that the core (3) is made of polyethylene.

17. Intervertebral disk prosthesis according to any one of claims 1 to 16, characterised in that the lower plate (2) comprises one or more  
15 openings (28, 29) in the vicinity of its front side, provided to receive prosthesis anchoring means (4, 5) in a vertebra.

18. Intervertebral disk prosthesis according to claim 17, characterised in that the opening (28) of the lower plate (2) is rectangular, and in that the anchoring means (4) consist of a body (40), forming an acute angle with the  
20 lower plate (2), and a head (41).

19. Intervertebral disk prosthesis according to claim 17, characterised in that the openings (29) of the lower plate (2) are circular, and in that the anchoring means (5) are nail-shaped.

20. Intervertebral disk prosthesis according to any one of claims 1 to  
25 19, characterised in that the upper plate (1) is convex on at least part of its upper surface to fit into the shape of the vertebrae.

1/4

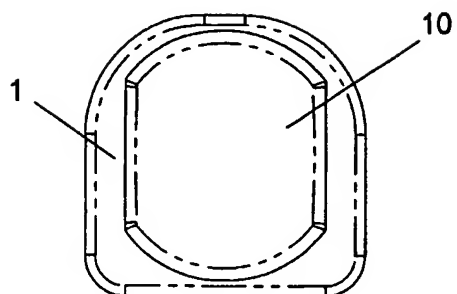


Figure 1a

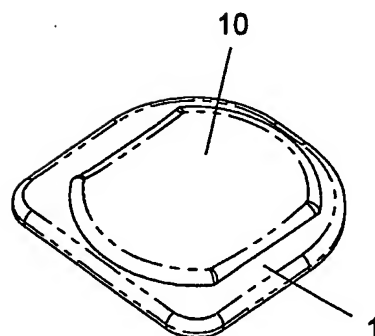


Figure 1b

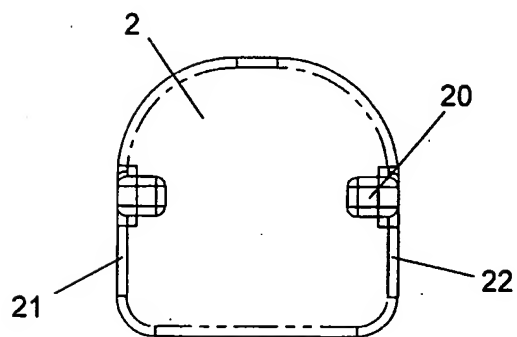


Figure 2a

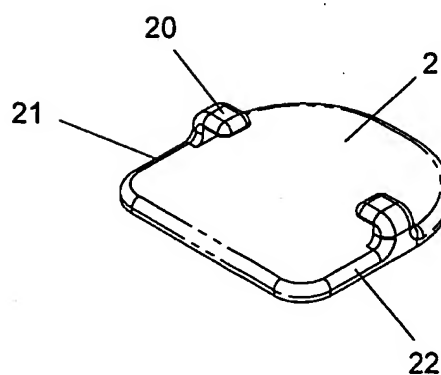


Figure 2b

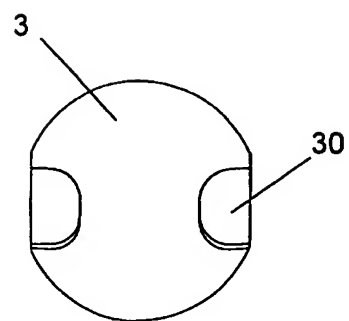


Figure 3a

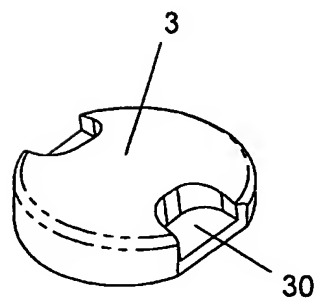


Figure 3b

2/4

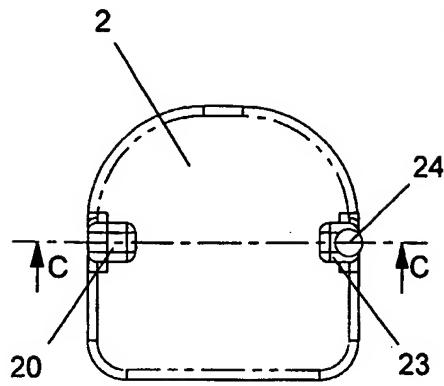


Figure 9a

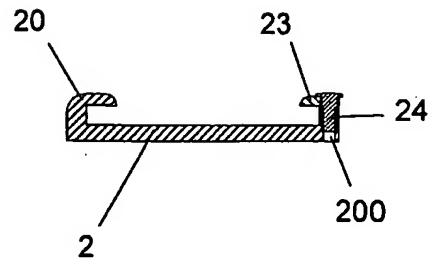


Figure 9b

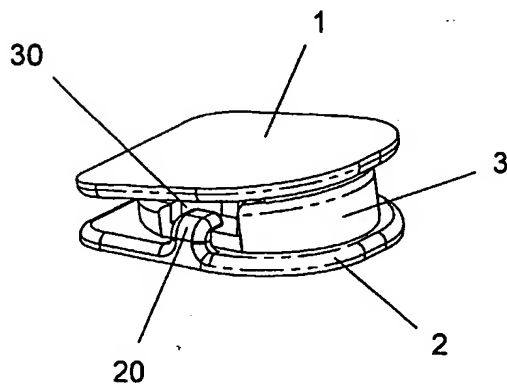


Figure 4a

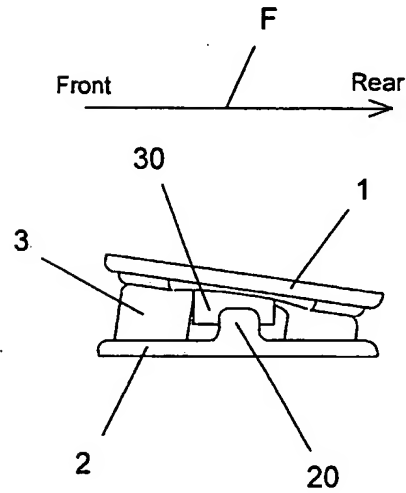


Figure 4b

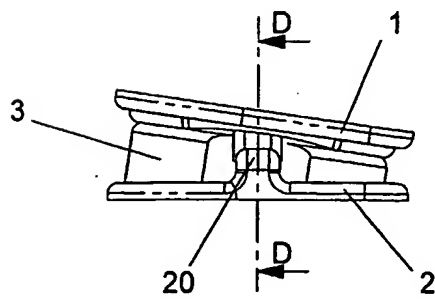


Figure 5a

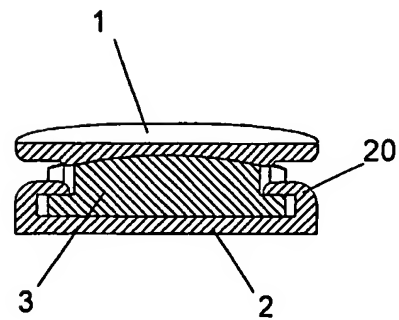


Figure 5b



3/4

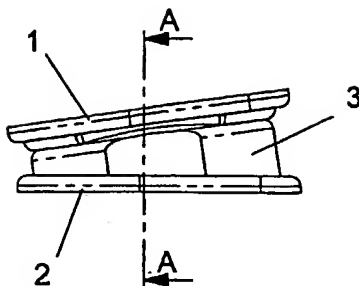


Figure 6a

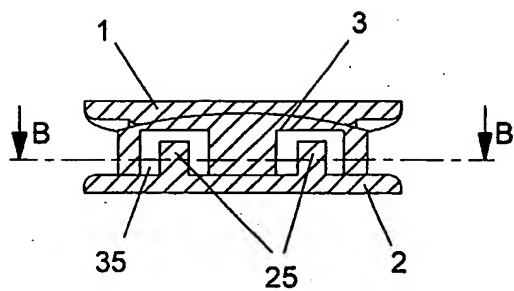


Figure 6b

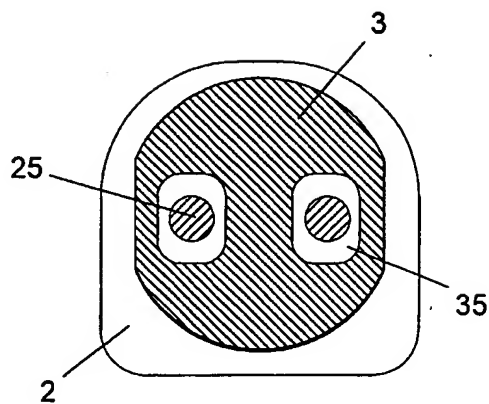


Figure 6c

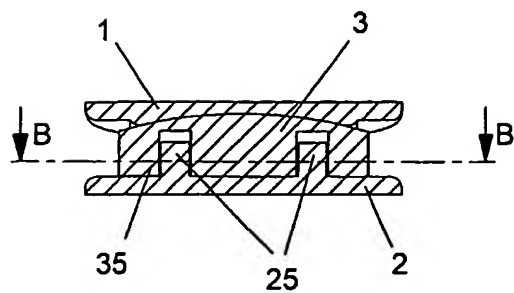


Figure 6d

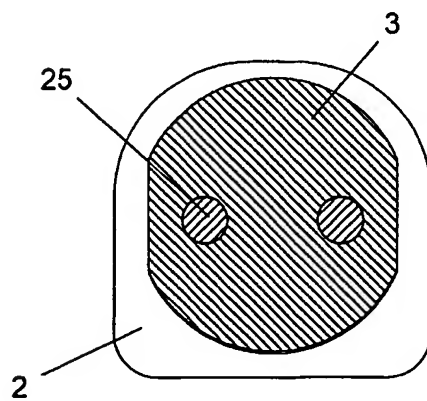


Figure 6e

4/4

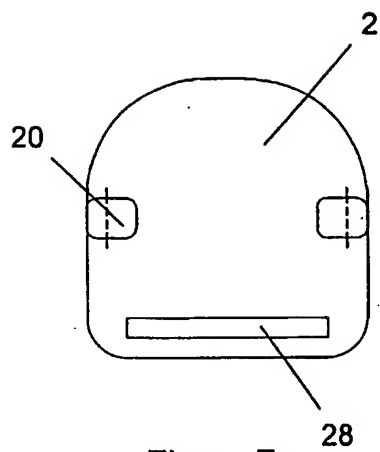


Figure 7a

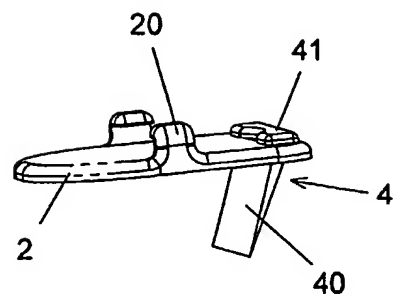


Figure 7b

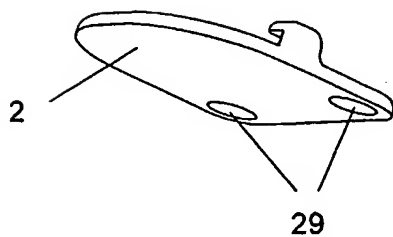


Figure 8a

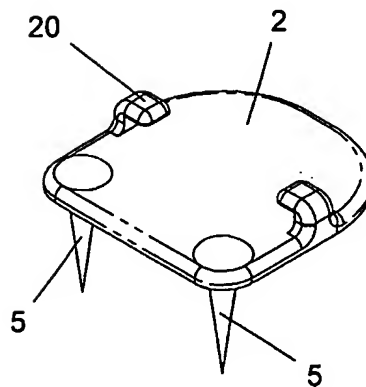


Figure 8b

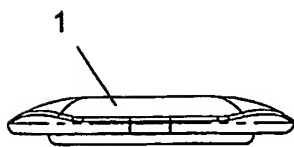


Figure 10a

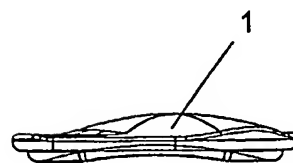


Figure 10b

# INTERNATIONAL SEARCH REPORT

Internat Application No  
PCT/15 03/04872

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61F2/44

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 368 350 B1 (GRIFFITH STEVEN L ET AL) 9 April 2002 (2002-04-09)  figures 20-33 column 8, line 36 -column 10, line 6	1-3, 7-10, 14-17,19
A	---	4-6
X	WO 01 01893 A (BEYERSDORFF BORIS ;MARNAY THIERRY (FR); SPINE SOLUTIONS INC (US)) 11 January 2001 (2001-01-11) claims 1,9-7; figures page 12, paragraphs 1,3  ---  -/-	1-3,7,8, 10,11, 14-16

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*S\* document member of the same patent family

Date of the actual completion of the international search

24 February 2004

Date of mailing of the international search report

03/03/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3018

Authorized officer

Stach, R

# INTERNATIONAL SEARCH REPORT

Internat. Application No  
PCT/IB 03/04872

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 560 141 A (LINK WALDEMAR GMBH CO) 15 September 1993 (1993-09-15)  figures 8-15 column 3, line 48 - line 50 column 4, line 57 -column 5, line 43	1-3, 7-10, 15-17,19
X	WO 00 74606 A (SDGI HOLDINGS INC ;ZDEBLICK THOMAS A (US); MCKAY WILLIAM F (US)) 14 December 2000 (2000-12-14) claim 1; figures 1-7,28,35,38,49A,49B page 16, line 25 - line 29 page 17, line 16 - line 30 page 22, line 22 -page 23, line 8 page 23, line 30 -page 24, line 1	1,2, 4-10,14, 20
A		11

## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/IB 03/04872

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 6368350	B1	09-04-2002	AU WO	3873000 A 0053127 A1	28-09-2000 14-09-2000
WO 0101893	A	11-01-2001	DE WO AU BR CA EP JP	29911422 U1 0101893 A1 7224500 A 9917397 A 2391330 A1 1194088 A1 2003503154 T	12-08-1999 11-01-2001 22-01-2001 05-03-2002 11-01-2001 10-04-2002 28-01-2003
EP 0560141	A	15-09-1993	DE AT DE EP ES JP JP US	4208116 A1 144695 T 59304327 D1 0560141 A1 2094393 T3 3017371 B2 6007391 A 5401269 A	23-09-1993 15-11-1996 05-12-1996 15-09-1993 16-01-1997 06-03-2000 18-01-1994 28-03-1995
WO 0074606	A	14-12-2000	AU CA EP JP WO US US	5320100 A 2376097 A1 1185221 A1 2003501142 T 0074606 A1 2002082701 A1 6402785 B1	28-12-2000 14-12-2000 13-03-2002 14-01-2003 14-12-2000 27-06-2002 11-06-2002